# Capacitive Accelerometer - Triaxial

## AIS 5425L

- Range ±2 to ±400 g
- Triaxial
- Extreme Robust Stainless Steel Housing
- Low Noise 7 to 400 µg/√Hz
- Frequency Range (±5 %) 0 to 2000 Hz
- Protection Class IP64
- Screw Mount M3
- Repairable
- Engineered for Precision - Built for Extremes

### Description

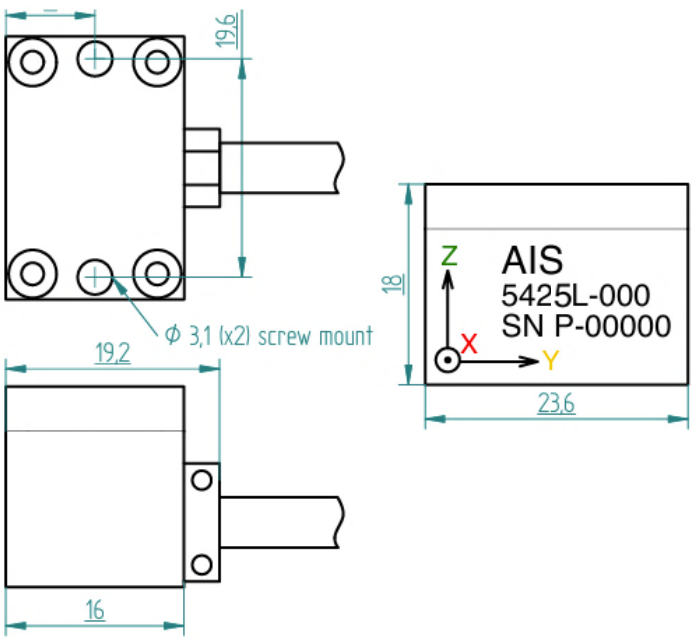
The AIS 5425L three-axis MEMS accelerometer, featuring variable capacitance (VC), is an extremely precise and reliable measurement device suitable for a wide range of demanding applications. It excels in low- to mid-frequency applications, particularly where reliable performance, extremely low noise, relative insensitivity to temperature changes, and high long-term stability are absolute requirements. It features three orthogonally arranged, low-noise sensors in a single, robust, epoxy-sealed housing made of stainless steel. Thanks to integrated voltage regulation and an internal voltage reference, no precision power supplies are required. The integrated electronics provide a choice of either a differential or single-ended analog voltage output.

### Features

- Triaxial MEMS-Variable Capacity Technology (VC)
- Differential Output Signal ±4 V
- Flexible Power Supply +6 bis +36 VDC
- High Shock Resistance
- Operating Temperature -55 bis +125 °C
- Temperature Compensated from -55 °C to +125 °C
- Excellent Scale Factor Stability
- Excellent Linearity typ. 0.15 % of FSO
- Excellent Long-Term Stability

### Dimensions

- 16 x 23,6 x 18 mm
- Sensor Weight w/o Cables 39 g




### Applications

- NVH testing
- Structural Durability Testing
- Vehicle Dynamics and Comfort Testing
- Machine monitoring
- Seismic Measurements
- Vibration Testing
- Structural Monitoring

### Options

- 0,5-4,5 V Single Ended Output
- 4–20 mA Current Output
- Dallas-ID (TEDS) with 20 kbit EEPROM
- Direkt Wiring or Connector
- Customized cable length and Labeling
- Customized connector types and pin layouts

### Services

- Calibration
- Repair Work
- Signal Conditioning

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### Technical Data

(All Values are typical at +24°C, $V_{DD}$ =$V_R$ =5.0 VDC, $T_C$ =25°C, Differential. Span = ±g range = 8000mV

| Dynamic | | 5425L-002 | 5425L-005 | 5425L-010 | 5425L-025 | 5425L-050 | 5425L-100 | 5425L-200 | 5425L-400 | Notes |
|---|---|---|---|---|---|---|---|---|---|---|
| Measurement Range | g | ±2 | ±5 | ±10 | ±25 | ±50 | ±100 | ±200 | ±400 | |
| Sensitivity (Scale Factor) Differential | mV/g | 2000 | 800 | 400 | 160 | 80 | 40 | 20 | 10 | Single ended is half value |
| Frequency Response | Hz | 0- 250 | 0 - 400 | 0 - 700 | 0 - 1300 | 0 - 1600 | 0 - 1700 | 0 - 1900 | 0 - 2000 | Typical ±5 % |
| Frequency Response | Hz | 0 - 525 | 0 - 800 | 0 - 1100 | 0 - 1750 | 0 - 2100 | 0 - 3000 | 0 - 3600 | 0 - 4200 | Typical ±3 dB |
| Non-Linearity | ±% FSO | <0,15 (typ) and <0,5 (max.) | | | | | | | | ±90% FSO |
| Transverse Sensitivity | ±% | <2 (typ) and <3 (max.) | | | | | | | | Typical |
| Output Noise | µg/√Hz | 7 | 12 | 18 | 25 | 50 | 100 | 200 | 400 | Differential |

| Electrical | | | |
|---|---|---|---|
| Supply Voltage | Vdc | 6 to 36 | Chip 5 VDC |
| Operating Current | mA | <10 per axis | $I_{DD}$+$I_{VR}$ |
| Bias (Offset) Error | mV | < ±80 / < ±80 / < ±50 / < ±50 / < ±50 / < ±50 / < ±50 / < ±50 | Typical |
| Output Impedance | Ohm | 90 | Typical |
| Long Term Scale Factor Stability | ±ppm | 500 typical and 1000 max. | |
| Isolation | | electronic circuit isolated from sensor housing, Sensor housing and cable shield are not connected | |

| Environmental | | | |
|---|---|---|---|
| Bias (Offset) Temperature Shift | ±ppm of Span/°C | 50 typical and +200 max. | |
| Sensitivity (Scale Factor) Temperature Shift | ±ppm/°C | -200 min. and +200 max. | |
| Operating Temperature | °C | -55 to +125 | |
| Storage Temperature | °C | -55 to +125 | |
| Shock Limit | g | 2000 / 2000 / 5000 / 5000 / 5000 / 5000 / 5000 / 5000 | Max. peak (0,1 ms) |
| Humidity | | Sealed | |

| Physical | | | |
|---|---|---|---|
| Material Housing | Stainless Steel | | |
| Weight Sensor | g | 39 | w/o Cable |
| Weight Cable 15 Wire | g/m | 30 | 15-wire, polyurethane, 85 shore A, 15 x 0,061 mm², Shield plated (0.10 mm) tinned copper |
| Weight Cable 6 Wire | g/m | 12,5 | 6-wire, polyurethane, 87 shore A, 6 x 0,064 mm², Shield plated (0.08 mm) tinned copper |
| Protection Class | IP | 64 | |
| Mounting Type | Screw Mount, Glue Mount, Magnet Mount with Adapter | | |
| Size l | mm | 16 | |
| Size w | mm | 23,6 | |
| Size h | mm | 18 | |
| Diameter Cable 15 Wire | mm | 4,4 ±0,1 | |
| Diameter Cable 6 Wire | mm | 3,0 ±0,1 | |
| Diameter Cable Split | mm | 15,0 ±0,3 | |



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## AIS 5425L

### Calibration

Factory Calibration (Included with the Sensor)

| Measurement Range Sensor | g | ±2 | ±5 | ±10 | ±25 | ±50 | ±100 | ±200 | ±400 |
|---|---|---|---|---|---|---|---|---|---|
| Order No. | | 12495 | 12858 | 12895 | 12860 | 12861 | 12862 | 12863 | 12864 |
| Frequency | Hz | 10 - 250 | 10 - 400 | 10 - 700 | 10 - 1300 | 10 - 1600 | 10 - 1700 | 10 - 1900 | 10 - 2000 |
| Amplitude | g | 1 | 3 | 5 | 5 | 5 | 10 | 10 | 10 |
| Reference Frequency | Hz | 16 | 16 | 80 | 80 | 80 | 80 | 80 | 80 |
| Measurement Points | | 3x16 | 3x22 | 3x22 | 3x22 | 3x22 | 3x22 | 3x22 | 3x22 |

Notes:
We recommend annual recalibration to ensure the sensor remains suitable for measurement use.
After overload, repair, or changes to the wiring, we strongly recommend recalibrating the sensor.
Calibrations according to customer specifications can be performed at any time, subject to consultation and technical feasibility. For example, we also offer calibrations in the low-frequency range of 0.4 Hz – 160 Hz and up to 5 m/s².

### Connection Assignment

The standard integrated cable has 15 wires, is 6 meters long, and has open ends (12-wire).
Optionally, the cable can be supplied with a cable splitter and 3 x 6-wire leads (with cable splitter).
Other cable lengths and configurations are available.

#### Cable Code 12X3

12 Wire with Cable Split - Separate power supply for all axes

| | X-Axis | Y-Axis | Z-Axis |
|---|---|---|---|
| Supply + | Red | Red | Red |
| Supply – (GND) | Black | Black | Black |
| Output + | Green | Green | Green |
| Output - | White | White | White |

#### Cable Code 8

8 Wire - joint power supply for all axes

| | X-Axis | Y-Axis | Z-Axis |
|---|---|---|---|
| Supply + | Red | Red | Red |
| Supply – (GND) | Black | Black | Black |
| Output + | Green/Orange | Green/Blue | Green |
| Output - | White/Orange | White/Blue | White |

#### Cable Code 12

12 Wire - Separate power supply for all axes

| | X-Axis | Y-Axis | Z-Axis |
|---|---|---|---|
| Supply + | Red/Orange | Red/Blue | Red |
| Supply – (GND) | Black/Orange | Black/Blue | Black |
| Output + | Green/Orange | Green/Blue | Green |
| Output - | White/Orange | White/Blue | White |

### Order Information

The cabling can generally be customized entirely to the customer's specifications and is assigned a corresponding code in the accompanying documentation.

| Type | Measurement Range [±g] | Cable Length [m] | Connector Type | Pin-Layout | Configuration | |
|---|---|---|---|---|---|---|
| AIS 5425L | 002 | 6 | A | 0 | 12 | Separate power supply for all axes |
| | 005 | | | | 8 | joint power supply for all axes |
| | 010 | | | | 12X3 | Cable Split - Separate power supply for all axes |
| | 025 | | | | | |
| | 050 | | | | | |
| | 100 | | | | | |
| | 200 | | | | | |
| | 400 | | | | | |

## Installation

The individual axis directions are marked on the housing, with positive acceleration defined as acceleration in the direction of the axis arrow.

The sensor must be mounted on a stable, level surface, and all screws must be tightened; alternatively, the sensor can be glued or secured with a suitable magnet, taking care to avoid any deformation of the sensor housing, as this can negatively affect the measurement result.

The sensor is equipped with a robust housing to provide the best possible protection for the sensor elements and electronics; improper handling and excessive strain can lead to damage that may not be immediately apparent and could cause electrical failures or reliability issues.

Always handle the sensor, cable, and connector with care; even though the sensor is specifically designed for harsh applications, impacts and shocks to the housing, such as from being dropped or struck with a hammer, can damage or destroy the sensor.

Tensile stress on the cable should generally be avoided and prevented by using appropriate strain reliefs.

Use the sensor only under the specified environmental conditions, and transport and store the sensor in protective packaging suitable for sensors (padded and ESD-protected).

## Operation

AIS GmbH triaxial variable-capacitance (VC) MEMS accelerometers deliver optimal performance when connected to data acquisition systems in a differential configuration; at zero acceleration, the differential output voltage is nominally 0 volts DC, and at rated acceleration, the output is ±4 volts DC. The output scaling factor is independent of the supply voltage, which ranges from +6 to +36 VDC.

The sensors are compatible with standard data acquisition systems; however, the user is responsible for selecting the appropriate measuring instrument and must ensure that the sensor is used within the specified electrical parameters.

The sensor connections are susceptible to damage from electrostatic discharge (ESD).

Improper wiring of the sensor connections will cause damage, and no modifications may be made to the sensor itself.

Ensure that the sensor and the connection cable are properly shielded and avoid ground loops.

Do not modify the wiring or pin assignments while the system is energized.

Before use, verify the plausibility of the measurement signal, e.g., by performing a ±1 g test.

## Safety Instructions for Installation and Operation

This data sheet is an integral part of the product. Read it carefully before using the product and keep it accessible for future reference throughout its entire service life.

Handling of the product, electrical connections, installation, and all other work on the product must be performed exclusively by authorized qualified personnel.

Take appropriate safety precautions to eliminate any risk of personal injury or damage to equipment resulting from a sensor malfunction.

## Engineered for Precision - Built for Extremes

AIS GmbH manufactures industrial-grade sensors that maintain their accuracy even under extreme forces, shocks, and vibrations. Our products are trusted in critical applications where durability and measurement accuracy are of paramount importance. Through exceptionally high manufacturing quality, strict testing standards, and application-oriented development based on many years of experience, AIS GmbH ensures long-term reliability even in the harshest operating environments. Our sensor solutions have proven themselves for many years in the fields of development and testing in the automotive industry, rail transportation, aviation, and defense technology. All products are designed for durability and serviceability, and we offer complete solutions, including consulting, accessories, calibration, and application-specific custom solutions.

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